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▼ AMEN CONTENT OF MEAT AND BONE MEAL IN DIFFERENT LEVELS SUBSTITUTION WITH A CORN- BASED DIET IN FEEDING ROOSTERS

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ABSTRACT

A corn based diet with 3200 kcal/kg metabolizable energy and 12 percent crude protein was formulated and substituted with 0, 7.5 and 15 percent level of each six samples of meat and bone meal from a local animal rendering plant. Each of thirteen experimental diets fed to 6 adult leghorn roosters in completely randomized design. AMEn values of experimental diets determined with total excreta collection method. AMEn content of each six sample of meat and bone meal was calculated by difference method. AMEn values of six meat and bone meal samples varied from 2033 to 3275 Kcal/Kg in 7.5 and 15 percent level substitutions and did not show significantly differences($P<0.05$) between two substitution levels. Ether extract was solely the best variable of predicting AMEn content of meat and bone meal but more accuracy estimation of AMEn was resulted by including ether extract and gross energy in the model. The equation was as AMEn= -282 ± 326 + 77±13 ether extract + 0.357± 0.09 gross energy, R^2 =0.98, P=0.0029. Mean content of AMEn in meat and bone meal was 2865±275 Kcal/Kg. The results showed that the studied meat and bone meal was rich of energy.

INTRODUCTION

At present, meat and bone meal (MBM) is mostly used as an animal protein source in diets of pig and poultry. The product is rich of available energy, indispensable amino acids, minerals and vitamins. Availability of energy and amino acid are high variable depend on processing condition, raw material source and processing system (Wang and Parsons 1998, Parsons et al 1997). Also, ash and fat content and method determination of available energy are the factors that influence on metabolizabel energy content of MBM. Apparent metabolizable energy corrected to zero nitrogen balance (AMEn) of MBM is equal to 2150 Kcal/Kg according to national research council (NRC 1994). In recent years, several studies(Krakas et al 2001, Dolz and Balz 1992, liu 2000, Wang and Parsons 1998, Dale 1997, Firman

2003) has been conducted on metabolizable energy content of MBM and the results showed higher metabolizable energy for MBM in comparison to NRC(1994). Basically, improvement in processing condition and system, level of MBM in experimental diets and kind of used birds in available energy studies are factors that may be contribute in the new resulted data on metabolizable energy content of MBM. MBM is newly produced under industrial condition in Iran and used as an ingredient of farm animal diets, particularly in poultry. The mixed slaughter waste of cows, sheep, goat and camels are usually used for producing MBM in rendering plants. The previously reports (Johnammadi et al 2005_a, Johnammadi et al 2005_b) indicated that MBM from Iran is rich of fat and deficient in crude protein and amino acid. The being different in two energetic compound, fat and crude protein, in comparison to MBM from other regions, may be result in different available energy content in MBM from Iran. The objectives of this study was to determine AMEn content of MBM from Iran in low level substitution by practical replacement assay and prediction of AMEn based on chemical composition.

MATERIALS AND METHODS

Six-fresh composed samples of MBM obtained in one–month sampling period from a local rendering plant. The samples were subjected to DM, CP, EE, Ash analysis according to AOAC (1990). GE measured by Parr adiabatic calorimeter bomb. A corn-based diet, containing 3200 Kal/Kg AMEn and 12 percent CP, was formulated. Each of six MBM samples were replaced at level of 0, 7.5 and 15 percent in basal diet and totally thirteen experimental diets was provided.

Each diet was fed as *ad libitum* for 4 days to three adult single comb roosters which kept in individual metabolic cages. After 4 days, roosters were starved for 24 hour for being devoid of gastrointestinal tract content. Then the experimental diets fed for 3 days and feed intake recorded and total excreta collected, freezed at -20 centigrade degree until drying time. Excreta were dried at -70 centigrade degree in oven and before weighting left for 24 hours at atmospheric condition in lab. DM according to AOAC (1990), Nitrogen by Leco instrument and GE by Parr adiabatic calorimeter bomb was measured in dried grounded excreta and experimental diets. AMEn content of experimental diets was calculated by formula described Sibbald (1986) and then AMEn content of each sample of MBM was estimated according to Marquardt(1962).Data analyzed in a completely randomized design by using GLM procedure of SAS (2002).Duncan test was used for comparison of means. REG/STEPWISE procedure of SAS (2002) was used also for regression analysis.

RESULTS

AMEn, gross energy efficiency(GEE) and apparent dry matter digestibility(ADMD) in each MBM sample at two level substitutions are presented in table 2. At two level substitutions, 7.5 and 15 percent, there was not significant differences in AMEn, GEE and ADMD of each MBM sample. Generally, MBM samples with high AMEn values had high GEE and ADMD too. Apart from substitution level of MBM, AMEn

values were 2948, 3243, 2724, 2913, 2416 and 2947 Kcal/Kg for each of 1 to 6 MBM samples. Mean value AMEn was result as much as 2865±275 Kcal/Kg.

Table 1. AMEn, gross energy efficiency(GEE) and apparent dry matter digestibility(ADMD) in MBM at two level of substitution

MBM sample: Substitution level	AMEn Kcal/Kg	GEE	ADMD %
1:7.5	2768 ^{abc*}	0.59 ^{ab}	36.4
1:15	3128 ^{ab}	0.66 ^{ab}	43.3
2:7.5	3248 ^{a}	0.66 ^{ab}	45.4
2:15	3238 ^{a}	0.66 ^{ab}	44.8
3:7.5	2383 ^{bc}	0.51 ^{b}	35.2
3:15	3065 ^{ab}	0.65 ^{ab}	38.5
4:7.5	2552 ^{abc}	0.57 ^{ab}	37.7
4:15	3275 ^{a}	0.73 ^{a}	48.7
5:7.5	2033 ^{c}	0.51 ^{b}	31.7
5:15	2800 ^{abc}	0.71 ^{a}	34.8
6:7.5	3027 ^{ab}	0.66 ^{ab}	50.8
6:15	2867 ^{ab}	0.63 ^{ab}	31.2
SEM	0.070	0.015	0.031

* Means in each column with common letter did not show significant differences($P<0.05$)

Results of regression analysis are in table 2. Three equations were resulted for estimation of AMEn in MBM from Iran. The best equation ,with 0.98 coefficient determination, was obtained when GE and Fat included in the model. Fat content and ADMD solely could produce a significant equation but the corresponding R^2 values were low.

Table 2. Regression equations for estimation of AMEn(Kcal/Kg) in meat and bone meal from Iran

Regression	Intercept	b_1	b_2	R^2	P value
Stepwise					
1	708 ±393	+110 Fat ±20	-	0.88	0.0053
2	-282 ±326	+77 Fat ±13	+ 0.357GE± 0.09	0.98	0.0029
Simple	1594 ±413	+3232ADMD±1036	-	0.64	0.0356

DISCUSSION

The effect of substitution level was not significant on AMEn content of MBM at present study. This finding is agreed with results of Dole and Balz(1992) that MBM has been substituted from 6 to 24 percent of a corn- based diet. In contrast, significant effect of substitution on AMEn content of MBM were found in some re-

ports (Karakas et al 2001, Martosiswoyo, 1988). In these studies, MBM were substituted up to 60 percent of basal diet. Usually at higher level of MBM, interaction between Ca and fat content of MBM decreased available energy. At present study, MBM samples had low calcium content and used in very low level substation. In poultry feeding practice, MBM is usually included up to 8 percent of diet. Therefore, AMEn value which obtained from substation of MBM at low level in metabolizable energy study may be logic. Mean content of AMEn from Iran was very higher that reported by NRC(1994). Higher AMEn value of MBM in comparison to NRC(1994) has been observed in results of other researcher(Dolz and Balz 1992, Karakass et al 2001, Firman 2003.). High fat content(20 %) in MBM from Iran may be responsible in producing higher AMEn value. The equations were obtained here for prediction of AMEn differed from other reported equations(NRC 1994, Dolz and Balz 1992, Farrel 1980). Differences in method of AMEn determination, chemical composition may be important in this respect. Although the best prediction equation of AMEn is resulted with using fat and GE of MBM from Iran but two other significant equations also could be used under some condition.

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